

A GUIDE TO COLLECTING BAMBOOS¹

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ABSTRACT

Because of their specialized nature and infrequency of flowering, bamboos are seldom collected. An illustrated guide is presented, showing which parts—especially vegetative—should be collected for a proper herbarium specimen. Instructions are also given on the preparation of preserved material in liquid and on the composition of the notes and label to accompany the collection.

Plant collectors are so accustomed to limiting their activities to plants in flower that sterile specimens are generally avoided. In the case of bamboos, which often flower only at intervals of many years, the collector rarely encounters them in the reproductive state. Both this fact and the complexity of the plant itself account for the relatively poor representation of bamboo specimens in herbaria. However, because of this very propensity of bamboos to flower seldom, taxonomic studies on the group have relied heavily on sterile characters. In fact, a complete vegetative collection is often sufficient to allow identification to the generic, if not specific, level.

We encourage collectors to make specimens of any bamboo they encounter, vegetative as well as flowering. We realize the importance of knowing how to look at the living plant, what structures are most significant taxonomically, and what information to record and parts to collect. With this in mind we have prepared a checklist of the observations to be made and representative parts to collect.

In the following checklist we have given, under General Data, the facts that should be recorded for any collection. Once these data have been recorded, the collector should survey the bamboo clump and analyze its major components, each of which is treated separately in the checklist: culms, culm leaves, branches, branch leaves, inflorescences, and rhizomes. Only rarely will all parts be present at the same time, for the strictly vegetative plant will lack flowers and the plant in flower may already have shed its leaves and lack new culms.

Under each heading we have listed, in a logical sequence, the observations that should be re-

corded, starting with overall or general characteristics and continuing with more specific ones, giving examples where appropriate. For instance, the interior of the culm may be solid or hollow with a thick or thin wall; if the latter it may contain a fine powder on the inner walls or be filled with liquid. The characters listed are examples of the most common kinds. Thus, under "Internode Color," additional variations may be found, such as "green mottled with purple." We have illustrated the most important features and at the end of each section we have suggested what parts to collect. For all measurements we recommend the metric system.

The final result of a complete collection should be adequate samples of all parts of the plant, including those that can be processed in the plant press, such as the branch leaves, and those that must be dried and tagged separately, such as culm sections or branch complements. In addition to the plant collection, a full set of notes will supplement the actual material gathered. The label that accompanies the mounted specimens must be concise and contain the most complete information possible, not including anything that can be seen on the herbarium specimen itself. Figure 6 is an example of such a label.

The general collector will naturally confine most of his work to data collecting and the gathering of only those parts that can be accommodated in a plant press and later mounted in the herbarium. The more serious student will want to collect bulky parts as well, although making such a collection often requires up to several hours. The researcher who will undertake anatomical, morphological, and cytological studies in the laboratory will need to collect further ma-

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terial in liquid preservative and can follow the methods and use the formulas presented at the end of this paper.

We recommend that the collector of bamboo include in his equipment a pair of heavy gloves to protect against spines and irritating hairs and a machete or similar cutting tool for severing the culms, along with a cross-cut saw for trimming them neatly. A good pair of pruning shears is indispensable.

Photographs, especially of the habit and habitat, greatly enhance any collection. A wide-angle lens is especially useful for photographing the habitat or an entire clump from close range and a macro lens for recording carriage of the foliage and details of structures such as buds and developing branches, inflorescences and spikelets.

BAMBOO COLLECTING CHECKLIST

A. GENERAL DATA.

1. *Date*.
2. *Locality*: use of latitude and longitude is recommended.
3. *Elevation*.
4. *Habitat*: characterize the vegetation and substratum.
5. *Common Names and Uses*: inquire locally.

B. COMPONENTS OF THE BAMBOO PLANT.

1. *Culms*.

a. *General Characteristics*.

- 1) *Spacing*: close together and forming clumps (if so, state diameter of clump and estimate number of culms included); widely separated and not forming discrete clumps.
- 2) *Habit*: strictly erect; erect and arching over; decumbent; clambering; vinelike (climbing or hanging).
- 3) *Size*: height or length; diameter.

b. *Node*.

- 1) *Occurrence*: solitary (Fig. 1a) or in close succession (Fig. 1g).
- 2) *Shape* (in longitudinal section): sides parallel (Fig. 1a); narrower below and widening above (Fig. 3d).
- 3) *Architecture*: single nodal line present, this horizontal (Fig. 3f) or dipping (Fig. 3i); nodal line plus nodal ridge present (Fig. 3d); girdle present (Fig. 3a).
- 4) *Surface*: smooth; pubescent; beset

with root primordia or root thorns (Fig. 3j).

c. *Internode* (Fig. 1a).

- 1) *Color*: green; bluish-green; green with white stripes; yellow with green stripes.
- 2) *Surface*: glabrous; pubescent; glabrous on the lower part, becoming scabrous above; glaucous.
- 3) *Shape in Cross Section*: round (Fig. 1e); sulcate (Fig. 1d); plano-convex (Fig. 3d).
- 4) *State*: hollow (indicate wall thickness) (Figs. 1a, b); solid (indicate amount of pith) (Figs. 1c, e).
- 5) *Contents* (when hollow): empty; powder on inside walls; filled with liquid.

To Collect: Two nodes and included internode (Fig. 1a). The culm may be split lengthwise. If culm is too long cut a shorter section and include only one node, but measure and record length of the internode.

2. *Culm Leaves* (Fig. 2).

a. *General Characteristics*.

- 1) *Duration on Culm*: persistent; caducous; tardily deciduous.
- 2) *Variability*: same shape throughout culm; thin and long at top of culm and wide and short at base of culm; becoming smaller toward top of culm.
- 3) *Color and Pattern* (when fresh): mottled; striped.
- 4) *Surface*: glaucous; densely covered with hairs; glabrous.
- 5) *Texture*: hard; soft.

b. *Blade*.

- 1) *Posture*: erect (Figs. 2a, b, f); reflexed (Fig. 2d); horizontal (Fig. 2c).
- 2) *Duration on Sheath*: remaining attached; falling.

To Collect: When possible, collect at least two culm leaves from that part of the culm where they are most representative in size and shape. If the leaves have already fallen, select from these. When the sheath is persistent cut it from the culm and press it flat, even though this may result in cracking and splitting.

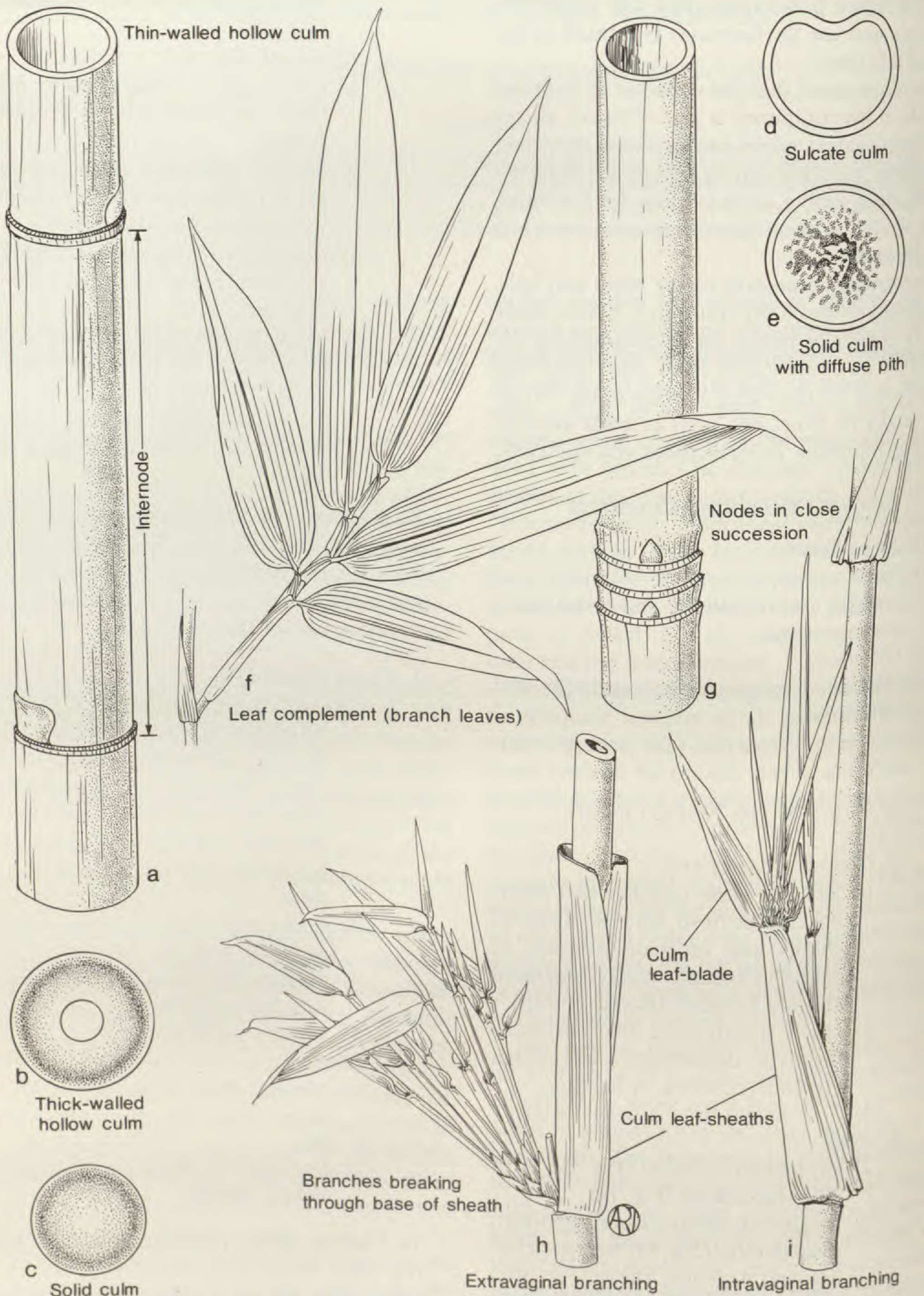


FIGURE 1. Culms, branching and branch leaves.

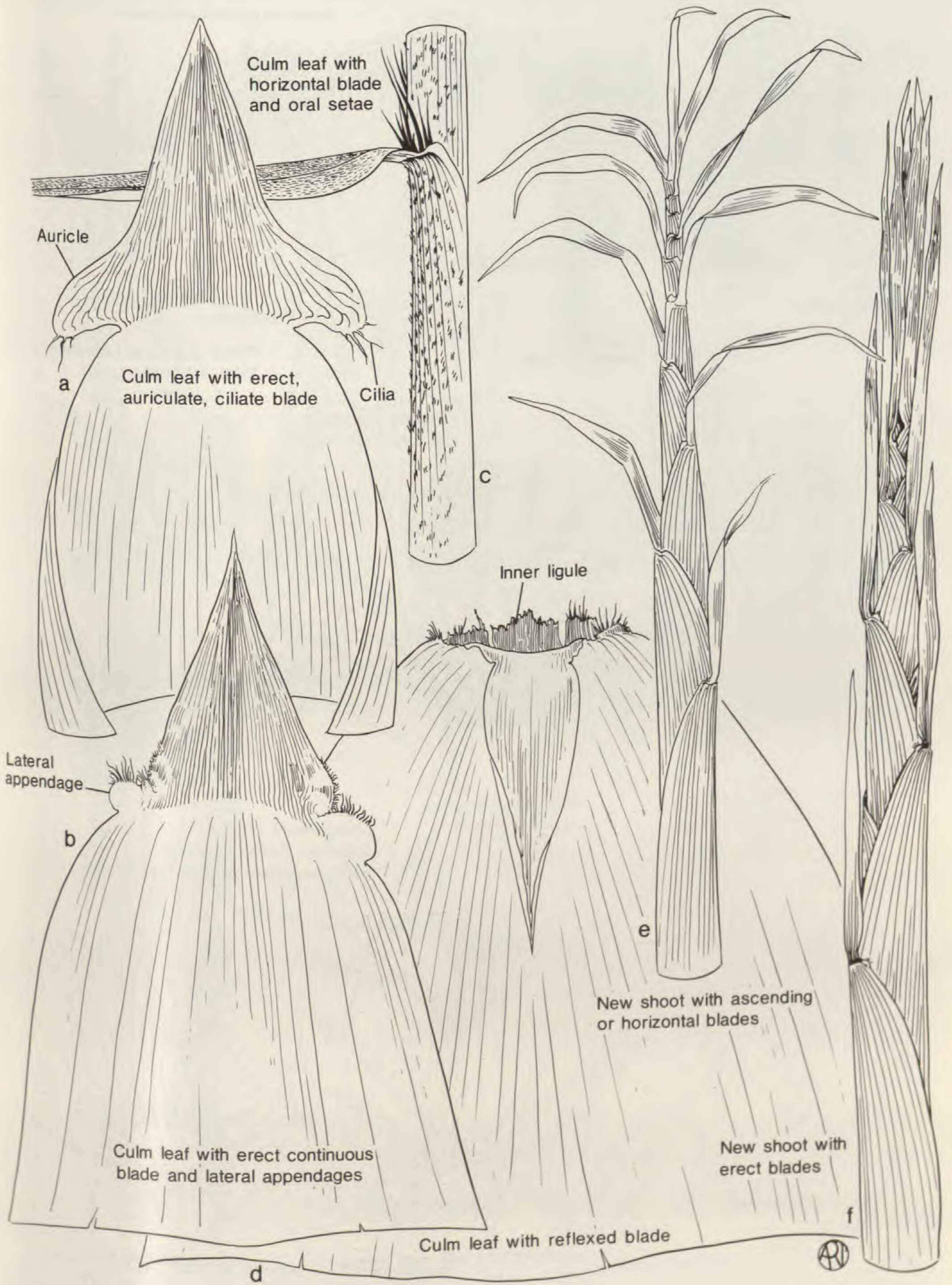


FIGURE 2. Culm leaves.

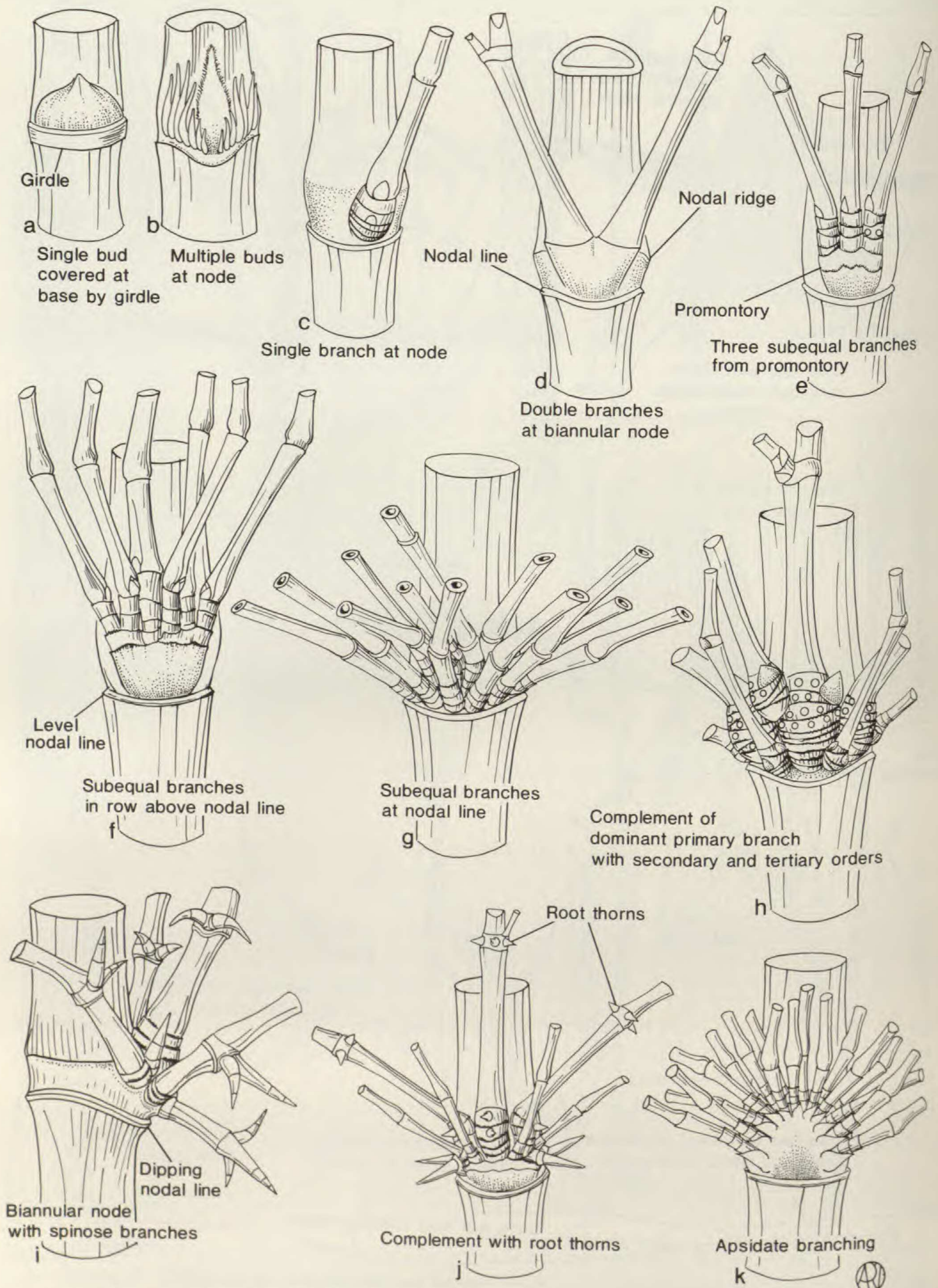


FIGURE 3. Nodes, buds, and branching.



FIGURE 4. Inflorescences.

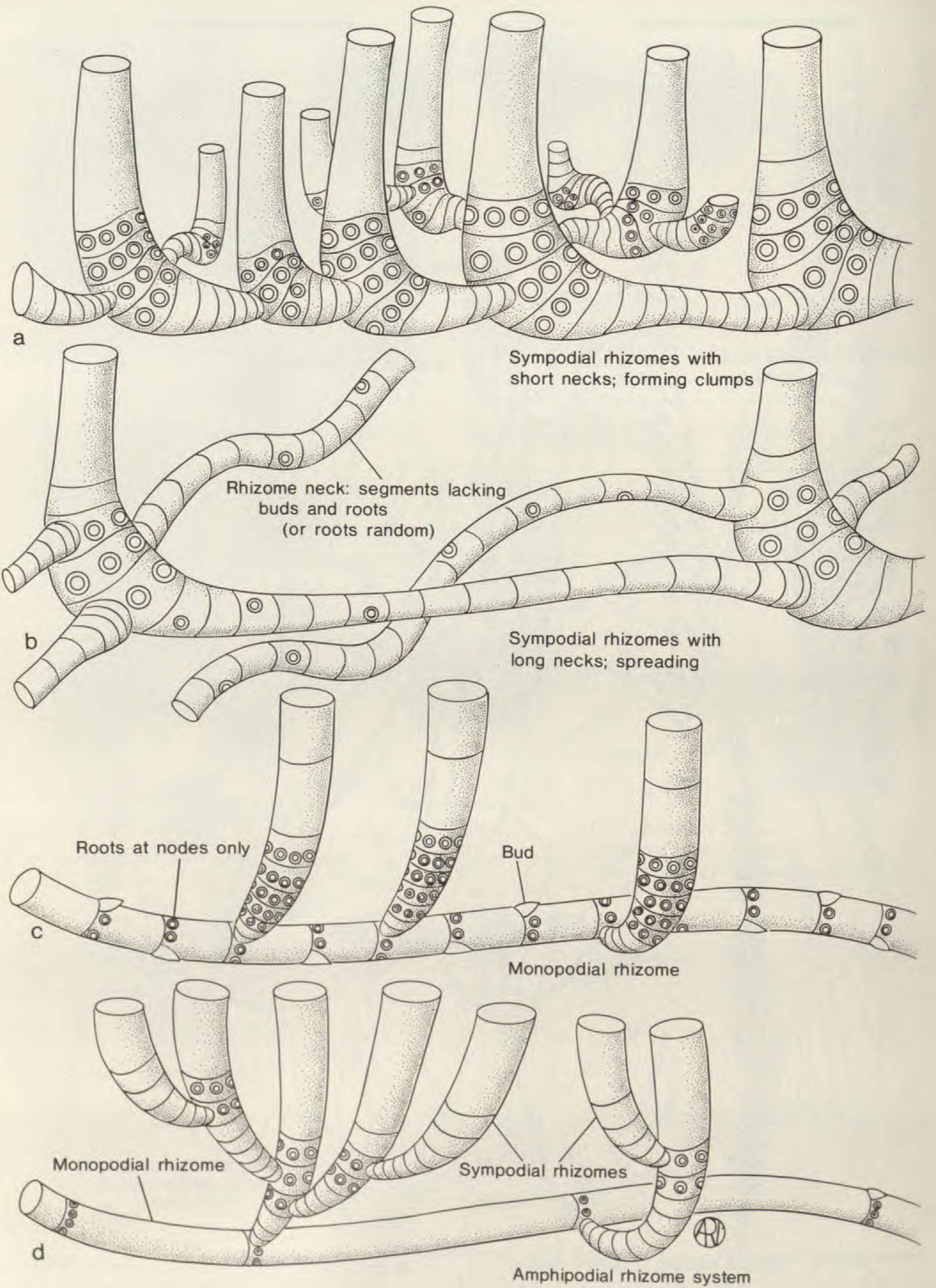


FIGURE 5. Rhizomes.

MEXICO

Olmeca recta Soderstrom

Veracruz: Mun. Catamaco, 10 Km N of Catamaco on road to Sontecomapan, 18°30' N / 95°01' W. Growing under tall trees in disturbed evergreen rain forest; common throughout the Tuxtla Range. Culms well separated from each other, 11–12 m tall, 4.5–5 cm diam., thin-walled, often filled with water, rotting easily. Rhizomes to 3 m long, running near surface of the soil. Culm leaf: sheath bluish-green, becoming pinkish-brown then stramineous; blade erect, deciduous, bright green. Branching: only from upper nodes, the branches intravaginal, arching out and becoming vinelike. Common name "Jimba."

Elev. 435 m

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*Collected under the auspices of the Smithsonian Institution
and Colegio de Postgraduados, Chapingo, Mexico*

FIGURE 6. Herbarium label for bamboo collection.

3. *Branches.*a. *General Characteristics.*

- 1) *Occurrence*: upper nodes only; all nodes.
- 2) *Habit and Length*: main branches elongated and vinelike; upper branches angled upward, lower reflexed.
- 3) *Development*: intravaginal (Fig. 1i); extravaginal (Fig. 1h); both intravaginal and extravaginal.

b. *Number and Arrangement*: single branches (Fig. 3c); 2 subequal branches (Fig. 3d); 3 or more subequal branches (Figs. 3e, f, g); 1 dominant with further branches from the node (Figs. 3h, i); 1 dominant branch (sometimes remaining as a bud) with smaller subsidiary branches below or around it (Fig. 3b, shown in bud stage); or in apsidate arrangement without a central branch (Fig. 3k).

c. *Origin*: produced at nodal line (Figs. 3c, g, h); produced above the nodal line (Fig. 3f); produced from a specialized process (Figs. 3e, j, k).

d. *Posture at Node*: appressed (Figs. 3f, k); horizontal (Fig. 3g); angled upward (Figs. 3c–f, h–k); angled downward (Fig. 3i).

e. *Modifications*: developing as spines (Fig. 3i).

To Collect: Take a representative branch complement from mature or old culm, even from dead culms that show the features accurately. Cut culm ca. 5 cm above and below the node and trim branches to ca. 5 cm, at least including the first node. Large culm sections may be split in half to save space. As with culm sections, allow to air-dry and remove all sheaths.

4. *Branch Leaves* (Fig. 1f).a. *General Characteristics.*

- 1) *Condition After Cutting*: wilting or curling immediately; remaining fresh.
- 2) *Habit*: stiff, flexuous; erect; pendent.

b. *Color*: green on both surfaces; lighter on one surface than the other; variegated.

To Collect: Leafy twigs, arranging the leaves to show both surfaces. Include leaves from young and old branches if there is a significant size difference. Press immediately to avoid curling. If this is not possible the material can be wetted and retained in a tightly secured plastic bag. Large leaves may require trimming and folding or dividing and pressing in more than one sheet.

5. *Inflorescences* (Fig. 4).a. *General Characteristics.*

- 1) *Habit*: erect; lax; drooping.
- 2) *Occurrence*: terminating leafy branches; occurring throughout a leafless plant.

b. *Size*: length and width if larger than an herbarium sheet.

c. *Color*: green; stramineous; purple.

To Collect: Flowering branches at all stages of development. When a flowering bamboo is found in the leafless state and leafy non-flowering clumps are encountered nearby, do not assume that the two are the same species. If uncertain, collect each plant under a separate number and cross-reference.

6. *Rhizomes* (Fig. 5).a. *General Characteristics.*

1) *Length Between Culms and Diameter*: short and thick; long and slender.

2) *Habit*: specialized as props for culm; running overground; running underground.

b. *Occurrence of Buds on Rhizome Neck*: present (Figs. 5c, d); or absent (Figs. 5a, b).

c. *Position of Roots*: at the nodal line only (Figs. 5c, d); at random (Fig. 5b).

To Collect: For running types collect a section of the rhizome ca. half a meter long. For clump-forming types collect 2–several rhizomes and sever culms ca. 15 cm above the ground. Air-dry the sample and remove all scales (sheaths).

C. COLLECTIONS IN LIQUID PRESERVATIVE.

1. *Morphological and Anatomical Studies*: parts of the plant can be preserved in FAA in the field and either stored this way or transferred to 70 percent ethyl alcohol, EtOH. FAA is prepared by mixing 90 parts of 50 percent EtOH, 5 parts of glacial acetic acid, H(Ac), and 5 parts of formalin. To make 1 liter, use 900 ml of 50 percent EtOH, 50 ml of H(Ac), and 50 ml of formalin. First add the H(Ac) to the EtOH

and then mix in the formalin. After several days the solution undergoes esterification and emits a sweet smell, which indicates the solution is too old for fixing material.

2. *Plant Parts for Preservation.*

a. *Branch Leaves*: the blades and portion containing the petiole and ligule are the important parts to collect. On small leaves cut the blade just above the base; on larger ones cut a section 3–5 cm long from the mid-portion of the blade, including the midvein. On exceptionally large blades cut a strip (3–5 cm wide) that includes the midvein and one side of the blade. For the petiole and ligule portion, cut the leaf just above the base of the blade and just below the apex of the sheath.

b. *Buds at Different Stages of Development*: these are important in following the stages of development of the mature branches. Usually only one bud is present (Fig. 3a) but sometimes more than one occurs at a node (Fig. 3b). The base of the sheath is often thickened and remains as a ring, or girdle, around the bud (Fig. 3a). Any excess culm tissue from around the bud can be trimmed away.

c. *Fleshy Fruits*: these may be collected in a separate bottle and sliced into sections if unusually large.

d. *Roots*: sections ca. 2 cm long should be cut for preservation.

e. *Seedlings*: only young ones, with the seed still attached, should be collected.

f. *Culm Sections*: some may be preserved if they exhibit unusual colors or patterns, such as mottling or stripes that would be lost in air-drying.

3. *Cytological Studies*: young spikelets can be fixed in a 3:1 solution for 24 hours and then transferred to 70 percent EtOH and kept under refrigeration when possible. The 3:1 solution is made by mixing 3 parts of absolute EtOH and 1 part of H(Ac). Spikelets should be collected from inflorescences that are still covered by the subtending sheath or just beginning to emerge (Fig. 4h).